WAVECOM Decoder

W-CODE Specifications V7.1

By WAVECOM ELEKTRONIK AG

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Protocols

List of Abbreviations, Remarks

* Currently being developed

. New in list

Parameters depend on the selected protocol. The full parameter ranges can only be used, when working with the source code

Specifications may be changed without prior notice

HF-Protocols

HF-Protocols (will be expanded in the future)
ALE-400
ALF-RDS
ALIS
ALIS-2
ARQ6-90
ARQ6-98
ARQ-E
ARQ-E3
ARQ-M2-242
ARQ-M2-342
ARQ-M4-242
ARQ-M4-342
ARQ-N
ASCII
AUM-13
AUTOSPEC
BAUDOT
BR-6028 (BAUDOT and ASCII)
BULG-ASCII
CHU
CIS-11
CIS-12 (HEX output)
CIS-14
CIS-36
CIS-36-50
CIS-50-50
CLOVER-2 (Option, ARQ, all CRC's)
CLOVER-2000 (Option, ARQ,all CRC's)
CODAN (SELCAL)
CODAN-9001 (Option)
COQUELET-13

HF-Protocols (will be expanded in the future)
COQUELET-8
COQUELET-80
CV-786
CW-MORSE
DCS SELCAL
DGPS
DUP-ARQ
DUP-ARQ-2
DUP-FEC-2
EFR
FEC-A
FELDHELL
FM-HELL
GMDSS/DSC-HF
G-TOR
GW-FSK
GW-OFDM*
GW-PSK
HC-ARQ
HF-ACARS (HFDL)
HNG-FEC
ICAO-SELCAL (ANNEX 10)
LINK-11*
MD-674
MFSK-16
MFSK-20
MFSK-8
MIL-188-110-16TONE (-110A/B App. A)
MIL-188-110-39TONE (-110A/B App. B)
MIL-188-110A, Serial Tones, 75-4800 bps
MIL-188-110B (App. C), STANAG 4539
MIL-188-110B, 3200-12800 bps
MIL-188-141A (ALE)
MIL-188-141B (BW0, BW1, BW4 data)
MIL-188-141B (BW2 & BW3 id only)
MIL-M-55529 NB/WB
OLIVIA
PACKET-300/600
PACTOR (all CRC's)
PACTOR-FEC (all CRC's)
PACTOR-II (all CRC's)
PACTOR-II-FEC (all CRC's)
PACTOR-III (Option, all CRC's)
PICCOLO-MK12
PICCOLO-MK6
POL-ARQ

HF-Protocols (will be expanded in the future)
PRESS-FAX
PSK-10
PSK-125 (BPSK, QPSK) and FLARC extension
PSK-125F
PSK-220F
PSK-250 (BPSK, QPSK) and FLARC extension
PSK-31 (BPSK, QPSK)
PSK-31-FEC
PSK-63 (BPSK, QPSK) and FLARC extension
PSK-63F
PSK-AM
ROBUST-PACKET
RUM-FEC
SI-ARQ
SI-AUTO
SI-FEC
SITOR-ARQ
SITOR-AUTO
SITOR-FEC
SP-14
SPREAD-11
SPREAD-21
SPREAD-51
SSTV Automatic
SSTV Martin 1, 2, 3 & 4
SSTV Robot 8s, 12s, 24s & 36s
SSTV SC-1 16 & 32s
SSTV SC-1 8s, 16s & 32s
SSTV Scottie 1, 2 , 3 & 4
SSTV Wraase SC-1 24s, 48s & 96s
SSTV Wraase SC-2 20s, 60s, 120s & 180s
STANAG 4285 75-3600 bps
STANAG 4415 75 bps (NATO ROBUST)
STANAG 4481-FSK (KG-84)
STANAG 4481-PSK
STANAG 4529 75-1800 bps
STANAG 4539 3200-12800 bps
STANAG 5065-FSK
SWED-ARQ
TWINPLEX ARQ
VISEL
WEATHER-FAX

VHF/UHF-Protocols

VHF/UHF-Protocols (will be expanded in the future)
ACARS

VHF/UHF-Protocols (will be expanded in the future)
AIS
APCO-25
ASCII
ATIS (Selcal Digital)
BIIS
CCITT (Selcal Analog)
CTCSS (Selcal Analog)
DCS SELCAL
DGPS
DMR with Live Voice (Digital Mobile Radio, XiR, or MOTOTRBO)
dPMR with Live Voice
DTMF (Selcal Analog)
DZVEI (Selcal Analog)
EEA (Selcal Analog)
EIA (Selcal Analog)
ERMES
EURO (Selcal Analog)
FLEX
FMS-BOS (Selcal Digital)
GMDSS/DSC-VHF/UHF
GOLAY
MOBITEX-1200 (with partial OVLS extension)
MOBITEX-8000
MODAT (Selcal Analog)
MPT-1327
NATEL (Selcal Analog)
NMT-450
NWR-SAME
PACKET-1200
PACKET-9600
PCCIR (Selcal Analog)
PDZVEI (Selcal Analog)
POCSAG
PZVEI (Selcal Analog)
SKYPER (POCSAG)
TETRA with Live Voice
VDEW (Selcal Analog)
VDL-M2
X.25
ZVEI-1 (Selcal Analog)
ZVEI-2 (Selcal Analog)
ZVEI-3 (Selcal Analog)
ZVEI-VDEW (Selcal Digital)

SAT-Protocols

SAT Protocols (INMARSAT protocols are optional)
AMSAT-P3-D
INMARSAT-AERO-P
INMARSAT-B-C-TFC (return)
INMARSAT-B-Data (forward)
INMARSAT-B-FAX (forward)
INMARSAT-B-HSD (forward, High Speed Data)
INMARSAT-B-TEL (forward), Live Voice
INMARSAT-B-TELEX-MM (forward)
INMARSAT-B-TELEX-SM (forward)
INMARSAT-C-EGC (Enhanced Group Calls)
INMARSAT-C-TDM
INMARSAT-C-TDMA
INMARSAT-C-TDM-EGC
INMARSAT-M -DATA (forward)
INMARSAT-M -FAX (forward)
INMARSAT-M -TEL (forward), Live Voice
INMARSAT-mM-DATA (forward)
INMARSAT-mM-FAX (forward)
INMARSAT-mM-TEL (forward) ask
NOAA-GEOSAT
ORBCOMM

INMARSAT Email Decoder

List of Decoded INMARSAT Email Protocols
AMOS (Mails and attachments)
GlobeWireless (Mails and attachments)
GTMail(Mails and attachments, butt CRC check missing, TNF files requires “WinMail Opener” software)
Rydex (Mails and attachments, attachement are not always renamed)
Skyfile (Mails and attachments)

FAX and Modem Protocols

FAX and Modem Protocols W-CODE
FAX-G3 T4 / T6 / JPEG / JBIG T.30 protocol with ECMM
FAX-G3-V.17
FAX-G3-V.27ter
FAX-G3-V.29
FAX-G3-V.34hdx
BELL103
BELL212A
V.21
V.22 / V22bis
V.23
V.26 /V26bis

FAX and Modem Protocols W-CODE
V.32 / V.32bis
V.34
V.90
V.92

List of Alphabet

List of Alphabets
Chinese (7Bit ASCII)
HEX
ITA-1 Latin
ITA-2 Baghdad70 Arabic
ITA-2 Baghdad80 Arabic
ITA-2 Cyrillic
ITA-2 Danish-Norwegian
ITA-2 Hebrew
ITA-2 Latin
ITA-2 Latin Transparent
ITA-2 Swedish
ITA-2 TASS Cyrillic
ITA-2 Third Shift Cyrillic
ITA-2 Third Shift Greek
ITA-5 Bulgarian
ITA-5 Danish-Norwegian
ITA-5 French
ITA-5 German
ITA-5 Swedish
ITA-5 US
Morse Arabic
Morse Cyrillic
Morse Greek
Morse Hebrew
Morse Latin
Morse Scandinavian
Morse Spanish
User defined 5-bit Alphabets based on UNICODE

Demodulator

Demodulators (Biterror rate within 3 dB of theory (white Gaussian noise, non fading channel))
AM for METEOSAT and NOAA-GEOASAT FAX transmissions
BPSK, 10-12000 symbols/s
CTCSS
CW Morse, 10-500 WPM, Center freq. 0.5 kHz-3.5 kHz, BW 100 Hz-1.2 kHz, AFC On/Off
DPSK, DBPSK, DQPSK, D8PSK, D16PSK, 10-12000 symbols/s
DTMF
DXPSK, dual carrier adaptive modulation, 2DPSK-D16PSK, 100 Baud
FAX-G3-V.17, FAX-G3-V.27ter, FAX-G3-V.29, FAX-G3-V.34hdx, BELL103, BELL212A, V.21, V.22 / V22bis, V.23, V.26 /V26bis, V.32 / V.32bis, V.34, V.90, V.92
FFSK, 10-12000 Baud, Shift 50 Hz-16 kHz
FSK, 10-2400 Baud, Shift 50 Hz-3.5 kHz, Center freq. 0.5 kHz-3.5 kHz
GFSK, 10-12000 Baud, Shift 50 Hz-16 kHz
Mark-Space FSK, 10-300 Baud, Shift 50 Hz-3.5 kHz, Center freq. 0.5 kHz-3.5 kHz
MFSK, Tone length 4-1000 ms / max. 64 Tones, Shift 50 Hz-3.5 kHz
OQPSK, 10-12000 symbols/s
QPSK, 10-12000 symbols/s
Software AM/ FM Demodulator for IF Inputs

Analysis Function

Analysis Functions
Autocorrelation up to 200’000 bits
Automatic analysis & decoding software for all data and FAX-G3 modulations
Automatic CRC recognition of all PACTOR-II and PACTRO-II-FEC systems
Automatic message type detection (ITA-2, ITA-5 and sync/async) for STANAG and MIL-Std
Bit correlation analysis. Raw FSK analysis: Graphical display of demodulated data on a raster time line. For visual recognition of character and block lengths.
Bit length analysis. Graphical display of demodulated data, with automatic calculation of bit length with bit pattern display
Code check for FSK codes
FSK analysis
Manual measurement of the frequency shift(s) with movable cursors
MFSK analysis for HF: Graphical display of MFSK tones with histogram.
Oscilloscope, real time, resolution up to 200 us/div
Phase plane display, HF, VHF/UHF Indirect BPSK, QPSK, OQPSK DPSK, 25-2400 Baud
Phase plane display, VHF/UHF Direct BPSK, DPSK, QPSK, OQPSK, 100-12000 Baud
Real-time FFT, averaging: 1-64 values, bandwidth 0.5, 1, 2, 4, 24, 48 kHz & 96 kHz and adjustable cursors, 20 frames/sec
Sonagram and FFT tuning display
Sonagram, real time display with cursor functions and history (full scrolling)
Sound card calibration tool
Symbol rate HF, VHF/UHF Indirect, Analysis 30-4000 Baud
Symbol rate VHF/UHF Direct, Analysis 30-24000 Baud
VHF/UHF Selcal analysis: Graphical display of FSK data for Selcal signal analysis.

Analysis Functions
Waterfall, real time display with cursor functions

General Software Characteristic

General Software Characteristics
Media Player/Recorder, direct recording and playback of WAV files
ALARM MONITOR, automatic detected text-string saving to HD or LAN, SMS output
Automatic insertion of time stamps
Bitstream: raw, synchronized FSK bitstream available through remote control interface.
Bitstream: raw, synchronized none adaptive PSK bitstream available through remote control interface.
File formats: TXT, BMP, Unicode, WAVECOM (with timestamps)
FSK baudrate history display with full graphical recall / averaging and cursor functions
FSK shift history display with graphical recall/averaging, cursor functions
Message type for most MIL-STD and STANAG codes (sync/async, data bits, parity bits, stop bits, MSB/LSB, ITA2/ITA5(ASCII)/HEX/STANAG5066
Pass-band filters in most codes
Pass-band tuning in FFT display in most codes
SERIAL LINK, serial data output over COM1-16 with
Sound card input, 16bit, 48 kHz, Stereo
STANAG5066 parser in MIL-STD and STANAG codes
TCP/IP direct data (IQ and PCM) interface for streaming and digital receivers (PXGF, IP-CONF)
TCP/IP Remote Control with WAVECOM GUI, full functionality over LAN/Internet (encrypted and speed optimized)
Unlimited scroll back buffers for text and graphic
Up to 8 decoders/computer
USB-License-Dongle
Virtual Audio Cable (VAC) support
WAV files playback and decoding, loop mode
XML Remote Control (API for C++ and C#, XML over TCP/IP)

Options

CLASSIFIER-NB

HF

HF Classifier	
Bandwidth HF	4 kHz or 8 kHz
Sampling interval (Ts)	1.6 or 3.2 sec
CW	Ts=1.6: 6 to 60 Bd Ts=3.2: 3 to 60 Bd

HF Classifier	
FSK	30 to 3000 Bd Shift ≤ 3500 Hz Modulation index: 0.5-20 Continuous availble during sampling interval
FSK-4/F7B	30 to 300 Bd, Shift ≤ 3500 Hz
MFSK	4-36 Tones
PSK 2/4 Variant A/B	30 to 3000 Bd
PSK 8/16 Variant A/B	30 to 3000 Bd
CIS-12	120 Bd
OFDM	25-512 Carriers Tg/Tu = 1/1 to .1/8 ≥25 Bd
OQPSK	25 Bd to 30 kBd
Operating	Display of classified signals in FFT Continuous mode Classifer Code Check with look-up table

Quality of modulation classification		
CW		18 dB (E_b/N_0)
FSK	m=0.8; 100-2400 Bd m=0.8; 50 Bd m≥2; 100-2400 Bd m≥2; 50 Bd	12 db (E_b/N_0) 15 db (E_b/N_0) 14 db (E_b/N_0) 16 db (E_b/N_0)
PSK 2/4 Variant A/B	100-2400 Bd	14 dB (E_b/N_0)
PSK 8/16 Variant A/B	100-2400 Bd	16 dB (E_b/N_0)

Accuracy of measured parameters		
CW	baud rate	5 %
FSK	baud rate center frequency	0.3 % 2% of baud rate
PSK	baud rate center frequency	0.2 % 0.15 % of baud rate

VHF/UHF

Not specified ! Use as is.

CLASSIFIER-WB (Option)

HF/VHF/UHF

Parameter	
Bandwidth HF/VHF/UHF	0.5 kHz; 1 kHz; 2 kHz; 4 kHz; 8 kHz; 12 kHz; 24kHz; 48 kHz or 96 kHz
Sampling interval (Ts)	1.6 or 3.2 sec
CW	Ts=1.6: 6…60 Bd Ts=3.2: 3…60 Bd
FSK	30…60 kBd, Shift ≤ 30 kHz Modulation index: 0.5-20

	Continuous availble during sampling interval
F7B	30…300 Bd, Shift ≤ 3500 Hz
MFSK	4-36 Tones
PSK 2/4 Variant A/B	30 Bd to 60 kBd
PSK 8/16 Variant A/B	30 Bd to 60 kBd
CIS-12	120 Bd
OFDM	25-512 Carriers Tg/Tu = 1/1….1/8 ≥25 Bd
OQPSK	25-2400 Bd
Voice (AM/FM/USB)	Yes
Sub-carrier modulation (AM, FM, SSB)	Corresponds to the values for the primary modulation type
Operating	Detection of MIL-STD and STANAG PSK signals Display of classified signals in FFT Continuous mode Classifer Code Check with look-up table

Quality of modulation classification		
CW		18 dB (E_b/N_0)
FSK	m=0.8; 100-2400 Bd m=0.8; 50 Bd m≥2; 100-2400 Bd m≥2; 50 Bd	12 db (E_b/N_0) 15 db (E_b/N_0) 14 db (E_b/N_0) 16 db (E_b/N_0)
PSK 2/4 Variant A/B	100-2400 Bd	14 dB (E_b/N_0)
PSK 8/16 Variant A/B	100-2400 Bd	16 dB (E_b/N_0)

Accuracy of measured parameters		
CW	baud rate	5 %
FSK	baud rate center frequency	0.3 % 2% of baud rate
PSK	baud rate center frequency	0.2 % 0.15 % of baud rate

Classifier Code Check (CCC) with Look-Up Table

Classifer Code Check Characteristic		
Look up table implemented as XML file		
XML Editor for table maintanance		
Data entry templates for FSK, MFSK, (M)PSK, OFDM, CW		
Process Steps	P1	Only classification is performed, but no decoding.
	P2	Classification and table check are performed, but no decoding.
	P3	Classification, table check and code check are performed, but no decoding.
	P4	Classification and table check are performed and finally the signal is decoded if a mode with an associated, valid detector was found
	P5	Classification, table check and code check are performed and finally the signal is decoded if a mode with an associated, valid detector was found.

W-SAT INMARSAT

SAT INMARSAT Option
SAT-A /B/C/M/mM/Aero, details see code table
Single channel INMARSAT C/B/M/mM Monitoring System, with FAX/Voice/Data File-Recording, FAX-Viewer for B/M/mM, B Voice-Playback. Live Voice, Sate Email Decoder. W-CODE-SAT requires an external receiver and interface for the IF.

W-CLOVER-2000

CLOVER-2000 Option (each option requires a separate license)	
Frequency range	HF
System	Half-duplex ARQ
AFC	±400 Hz, with max. single step ±10 Hz
Speed	62.5 Baud
Modulation	PSK2A, PSK4A, PSK8A, PSK16A, ASK2PSK8, ASK4PSK16, 2DPSK2A; 8 tones
Alphabet	ITA-5

W-CLOVER-2

CLOVER-2 Option	
Frequency range	HF
System	Half-duplex ARQ
AFC	±200 Hz, with max. single step ±15 Hz
Speed	31.25 Baud
Modulation	PSK2A, PSK4A, PSK8A, PSK16A, ASK2PSK8, ASK4PSK16, 2DPSK2A; 4 tones
Alphabet	ITA-5

W-PACTOR-III

PACTOR-III Option	
Frequency range	HF
System	Half-duplex synchronous ARQ
AFC	±50Hz
Speed	100.0 Baud
Modulation	DBPSK, DQPSK; 2, 6, 14, 16, or 18 tones
Alphabet	ITA-5 with block coding, CRC is displayed

W-CODAN-9001

CODAN-9001 Option	
Frequency range	HF
System	Half-duplex asynchronous adaptive ARQ
AFC	In the range ±3100. automatic frequency control (AFC): +/-9 Hz
Bandwidth	1800 Hz
Speed	16 x 75 Baud
Modulation	Differential PSK4A; 16 tones
Supported functions	output of demodulated multichannel symbols

	derandomization of secure-mode derandomization of unsecure-mode arbitrary start values for derandomization of secure-modes output of recognized start value in secure-mode output of status information output of recognized frame type decoding of chat-messages into text decoding of text-file transmissions into readable output decoding of data- transmissions into hexadecimal output decompress data store Channel Data for analysis purposes automatic recognition of secure and unsecure modes 7-Bit-ASCII Alphabet used by CODAN-9102-Software Secure Interactive Packets
Please enquire	Chirp decoding

W-CODE System

Hardware/System	
Concept	Software only solution
Sound card input: maximum sampling rate	192 kHz
Sound card sampling rate precision	<50 ppm, <20ppm recommended
Screen Resolution (SVGA)	min. 1024x768
Minimum CPU requirements	P4,1.6 GHz
Minimum RAM requirements	512 MB
OS	WINDOWS XP, Windows 7, Server 2008, 32/64-bit, Tested with English version

Ordering Information

Ordering Information	
Documentation	English User Manual
Online Help	English
Software	Installation CD with latest software version and WAV signal samples
Updates	Software update by DVD or Internet http://www.wavecom.ch
Warranty	2 years

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